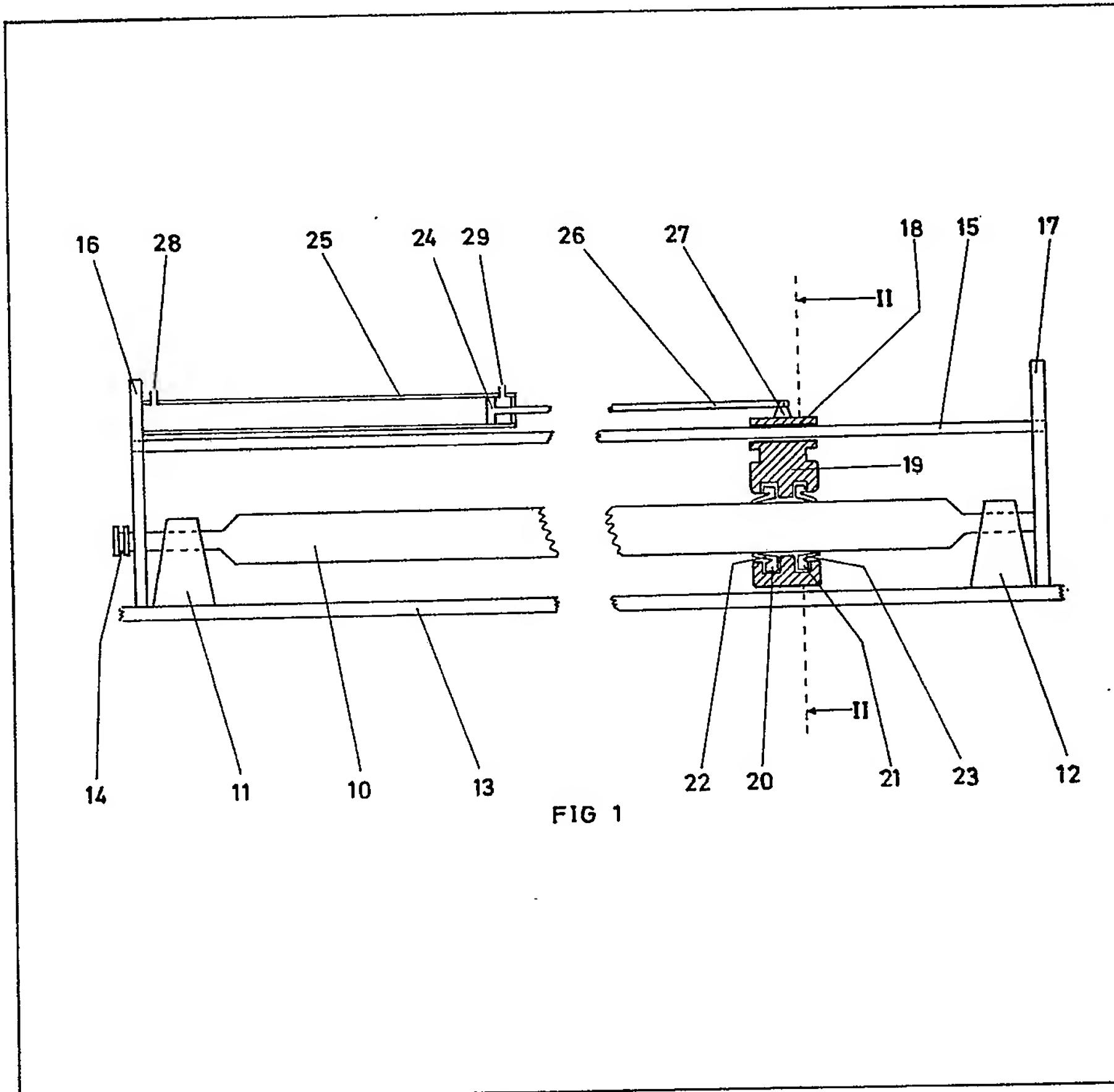


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(54) Cleaning a coating roll

(57) A coating roll 10 is cleaned by scraping members 20,21 having scraping edges 22,23 conforming to a circumferential portion of the roll surface reciprocated along the length of the roll. A housing 19 supports the scraping members which may be fabricated from a synthetic polymeric material, optionally including a reinforcing agent such as glass fibres, and is preferably ring-shaped with an annular scraping lip slightly inclined towards the roll axis. Removal of coating debris (such as dried polymeric latex) from the roll surface may be effected in the presence of a liquid (solvent) and by rotating the soiled roll during the cleaning operation. Simultaneous cleaning of several rolls may be effected.



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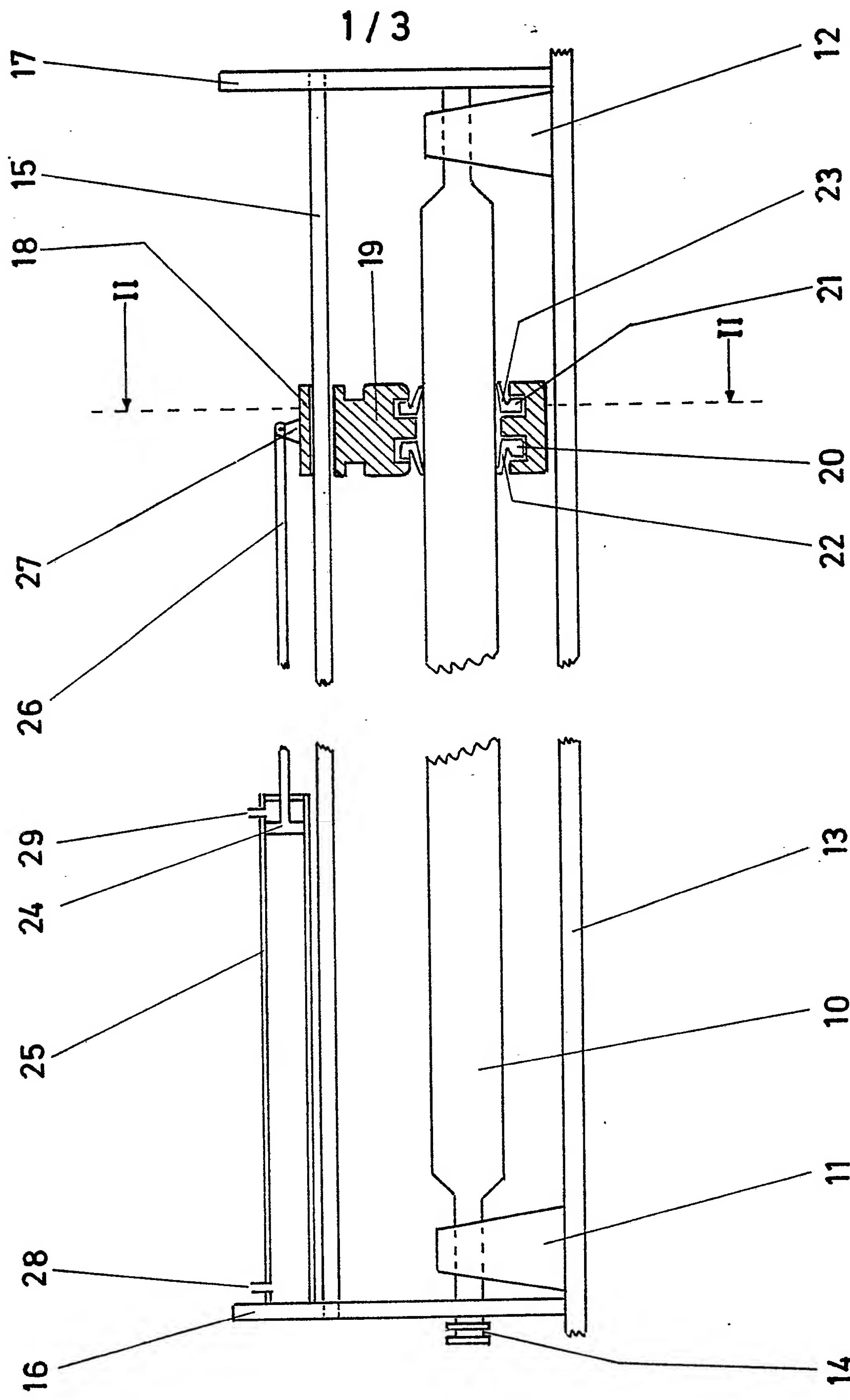


FIG 1

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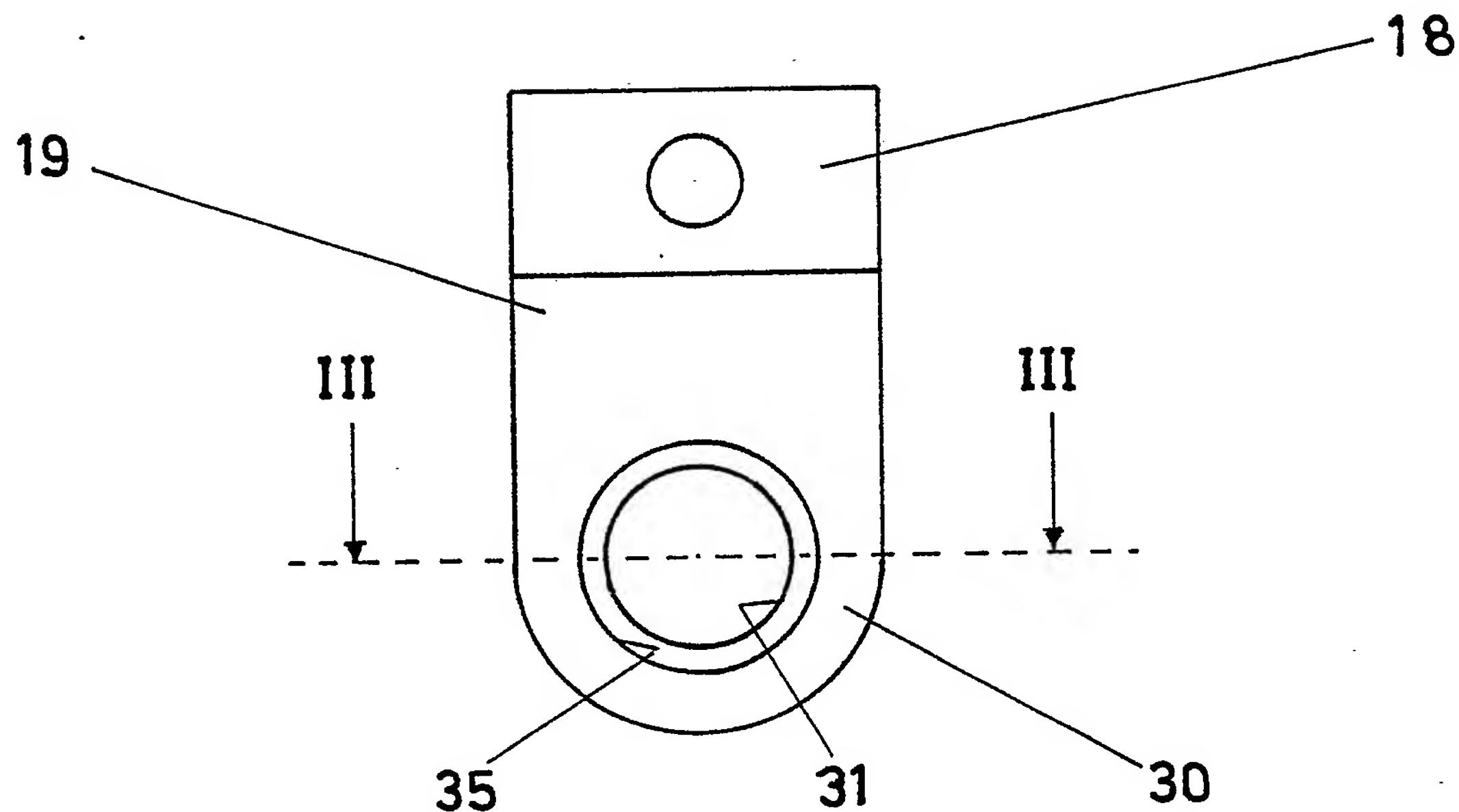


FIG 2

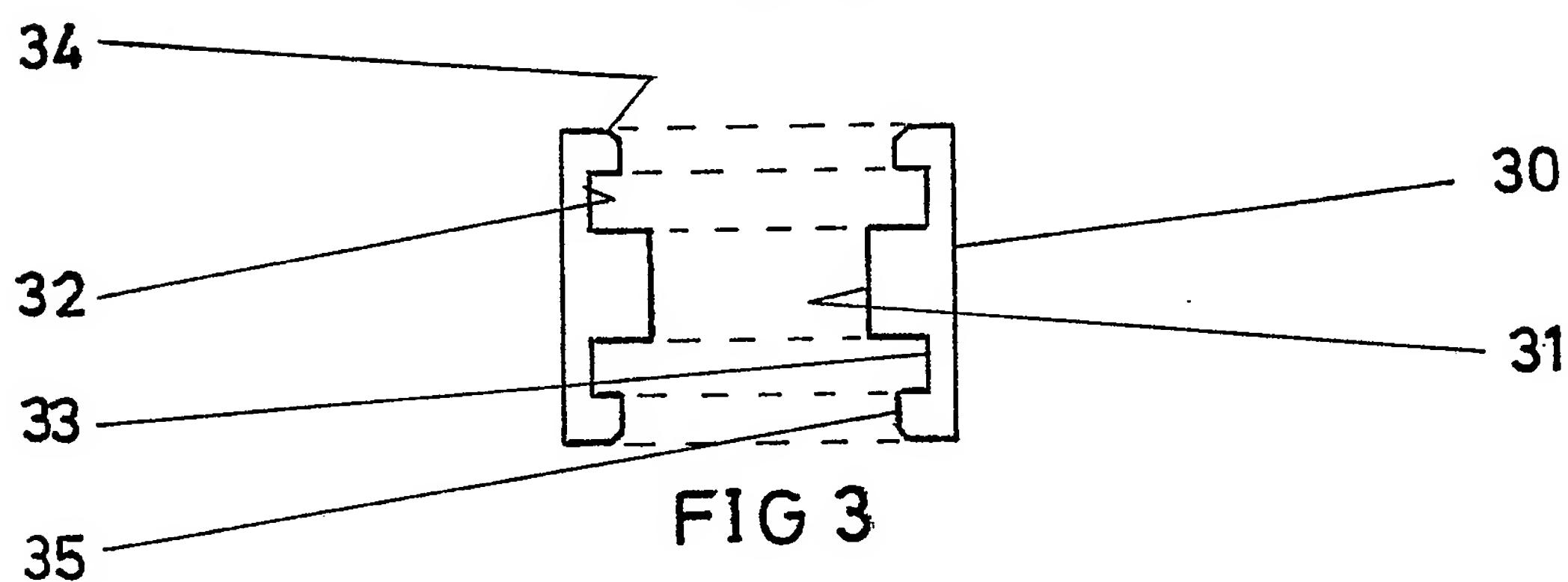


FIG 3

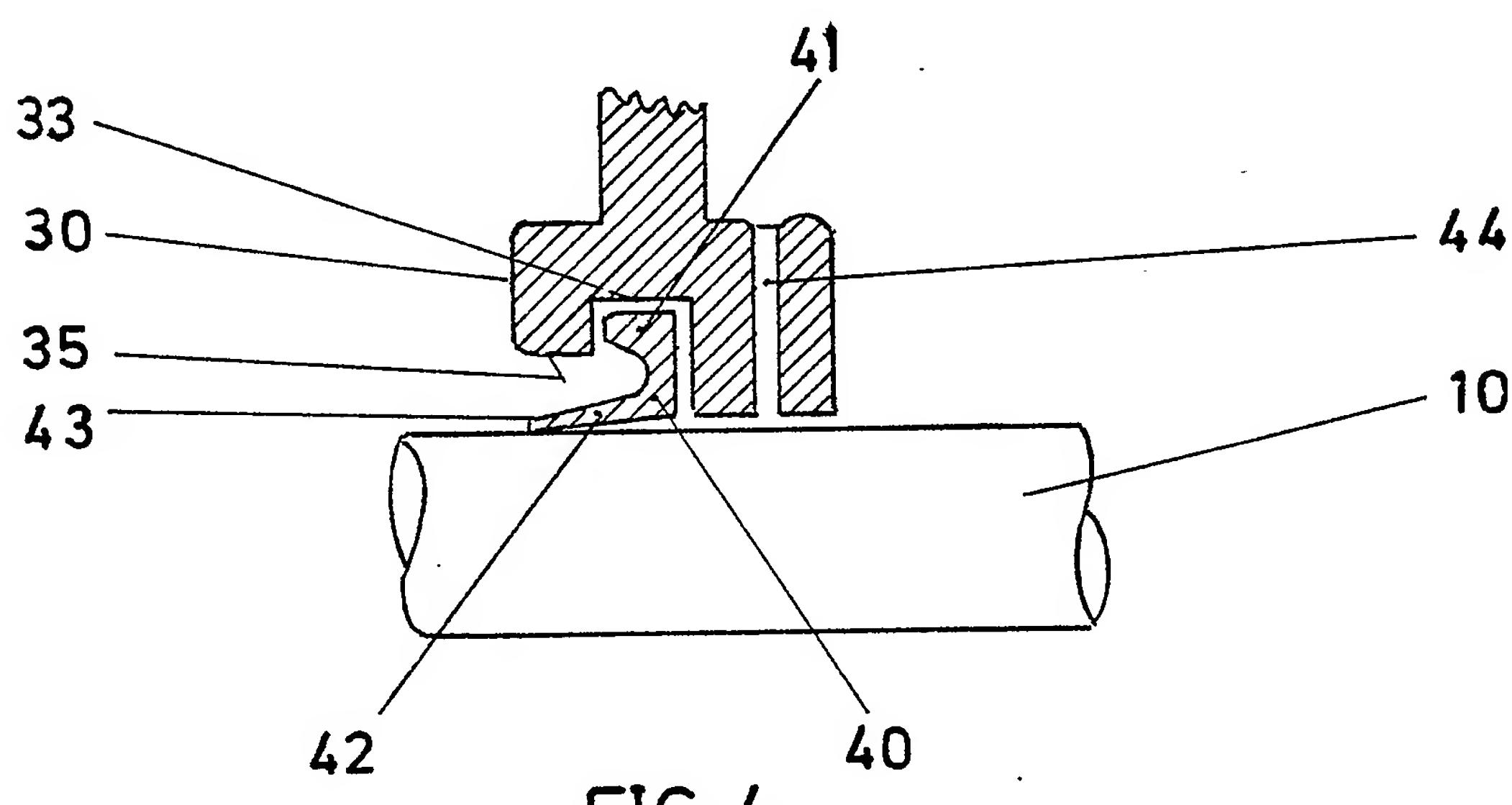


FIG 4

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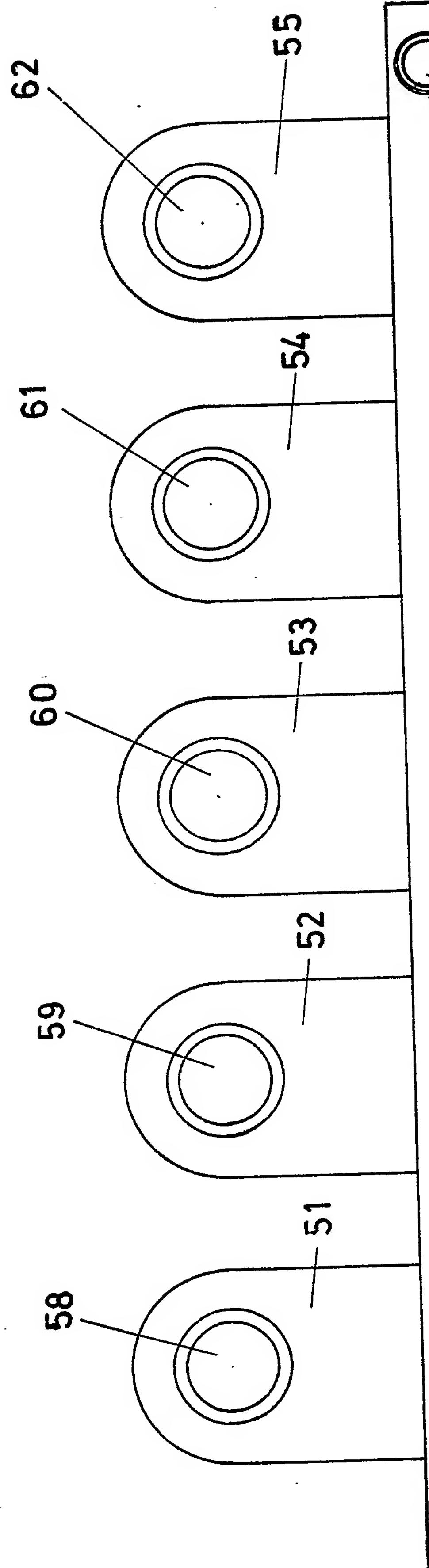


FIG 6

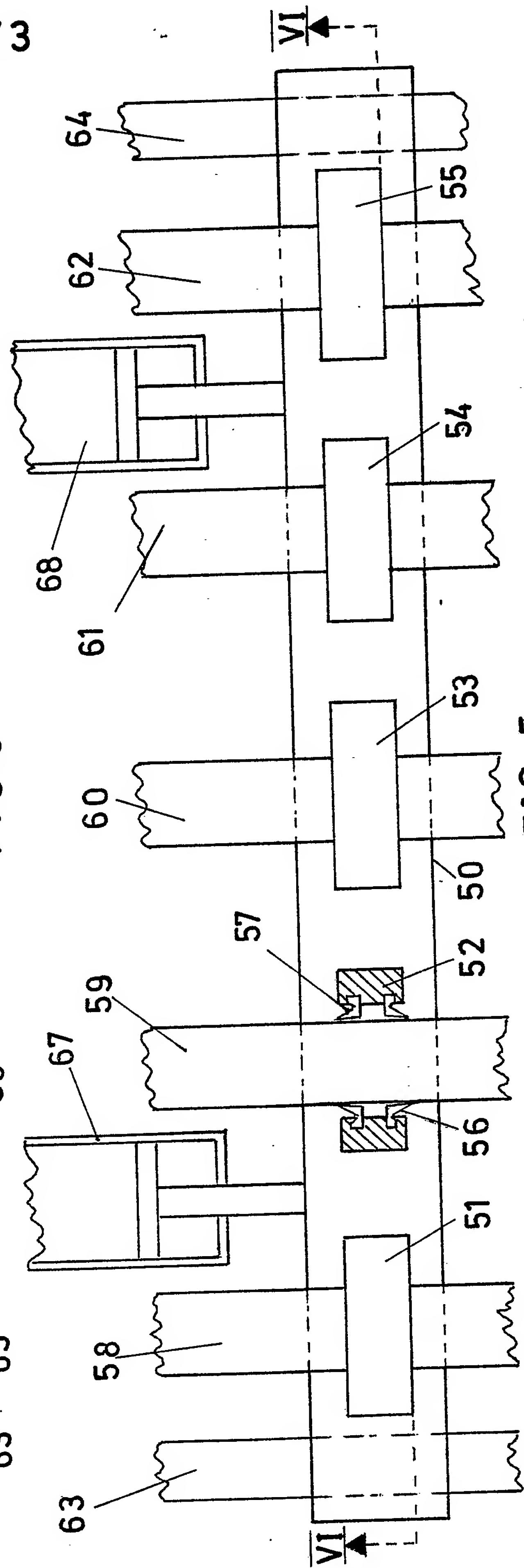


FIG 5

SPECIFICATION

Apparatus and method for cleaning a coating roll

5 This invention relates to a method and apparatus for cleaning the surface of a coating roll, and in particular the surface of a roll employed in the coating of webs.

The application of a liquid coating medium onto the surface of a substrate, such as a web of paper or plastics film, is conventionally effected by means of an applicator roll rotating, in contact with the web surface, in a direction either cocurrent or countercurrent to the direction of movement of the web. The 10 coating medium, such as an ink or polymeric heat-sealable composition, may be metered onto the surface of the applicator roll and thence deposited on the web surface, and, if desired, the deposited medium may be spread on the web surface by 15 means of a spreading or smoothing roll. The term "coating roll", as hereinafter employed, includes both an applicator roll and a smoothing or spreading roll.

Periodic cleaning of a coating roll is required to 20 remove debris accumulated on the roll surface in the course of the coating operation. In particular, if the coating operation is temporarily interrupted - for example, by breakage of the web or for maintenance of the equipment, the liquid coating medium tends 25 to form a dry, tenaciously adherent, crust on the roll surface. Removal of such deposits from the roll surface has hitherto been effected by a manual technique involving the use of abrasive scouring pads, the technique being both laborious and liable 30 to damage the surface of the roll. Furthermore, the cleaning technique has usually to be performed in cramped unpleasant conditions on the coating plant, or the contaminated roll has to be removed for 35 cleaning in a more congenial environment, thereby disrupting the coating operation for a prolonged 40 period.

We have now devised an improved roll cleaning technique.

Accordingly, the present invention provides an 45 apparatus for cleaning the surface of a coating roll comprising a scraping assembly including a scraping member having a scraping edge conforming to at least a circumferential portion of said 50 roll surface, and a housing for supporting said member with the scraping edge in engagement with said roll surface, and means for reciprocating the scraping assembly 55 relative to the longitudinal axis of the coating roll.

The invention further provides a method of cleaning the surface of a rotatable coating roll comprising 60 conforming the scraping edge of a scraping member to at least a circumferential portion of said roll surface, rotating the coating roll about its longitudinal axis, and reciprocating the scraping member along the roll surface relative to said longitudinal axis.

65 The invention still further provides a coating roll

the surface of which has been cleaned by the method of the immediately preceding paragraph.

The scraping member provides a scraping edge conforming to at least a circumferential portion of 70 the roll surface. Conveniently, therefore, the scraping member includes a scraping edge of generally arcuate configuration matching the curvature of the roll surface. Preferably, a scraping edge engages substantially the entire circumferential surface of the 75 roll, and the scraping assembly may therefore include a plurality of segment-like scraping members the respective arcuate scraping edges thereof being sequentially disposed around the roll surface in a plane substantially normal to the longitudinal 80 axis of the roll. Alternatively, and preferably, the scraping member is in the form of a unitary annular ring embracing the roll surface. The annular ring may be circumferentially continuous, or discontinuous (split) to facilitate removal from around the 85 roll surface.

The, or each, scraping member conveniently comprises a body portion for location in the housing, and a rim or lip extending from the body portion to provide a scraping edge for engagement with the 90 roll surface. A ring-like scraping member therefore suitably comprises an annular body portion, having an orifice therein to accommodate a coating roll, and an annular rim or lip extending from the periphery of the orifice in a direction generally parallel to, and 95 preferably slightly inclined (e.g. included angle between lip or rim and roll up to about 30°) towards, the longitudinal axis of the roll. The free edge of the rim or lip remote from the body portion may be relatively blunt or may be in the form of a knife-edge 100 to improve scraping efficiency.

If desired, the, or each, scraping member may include a plurality of scraping edges axially spaced apart relative to the longitudinal axis of the coating roll with the respective scraping edges disposed in 105 axially opposite directions to ensure that scraping of the roll surface occurs during both forward and reverse phases of the reciprocating movement of the scraping assembly relative to the coating roll. Alternatively, at least a pair of independent scraping 110 members having their respective scraping edges disposed in axially opposed directions may be incorporated into the housing.

Desirably, the, or each, scraping member is fabricated from a material conferring sufficient rigidity to 115 remove adherent deposits from the roll surface while being sufficiently flexible to conform readily to the contour of the roll without abrading the surface thereof. Suitable materials include synthetic thermoplastic polymers, particularly polyamides such as 120 polyhexamethyleneadipamide and polycaprolactam. The rigidity of such polymers may be increased, if desired, by the inclusion therein of suitable reinforcing agents - such as glass fibres, glass beads, or ground glass, or mineral fillers - such as wollastonite, quartz, kaolinite and bentonite.

The housing serves to support the, or each, scraping member in contact with the surface of a roll to be cleaned, and conveniently comprises an annular collar having an axial bore therein to receive the 130 roll and means to releasably retain a scraping

member in engagement with the roll surface. Conveniently, the retaining means comprises a peripheral recess, at the, or each, entrance to the axial bore, in which the, or each, scraping member may be retained by suitable gripping means such as one or more grub screws or a removable retaining plate. Preferably the peripheral recess is profiled to provide an annular rim or lip through which the scraping member may be inserted under slight radial compression, the scraping member then being allowed to expand to its normal radial dimensions and consequently being retained by the annular rim or lip in the peripheral recess.

Reciprocation of the scraping assembly parallel to the longitudinal axis of the coating roll may be effected by conventional means - for example, by mechanical, electrical, hydraulic or pneumatic means. Thus, reciprocation may be effected by means of a cable or chain attached to the housing and suitably energised to pull the scraping assembly along the length of the roll. In a preferred embodiment of the invention the housing depends from a bearing block slideably mounted, on a slide support comprising at least one relatively rigid longitudinal member extending substantially parallel to the longitudinal axis of the roll, and pneumatically actuated through a reversible switching assembly to reverse the direction of travel of the housing at each end of the roll.

Removal of coating debris from the roll surface may be assisted if the scraping is effected in the presence of a liquid, such as water or, preferably, a solvent for the dried coating medium. The liquid is suitably directed onto the roll surface in the vicinity of the scraping edge - for example, from a port in the housing. Suitable drainage means may, if desired, be incorporated in the housing. Gaseous fluid may also be directed at the roll surface to assist the removal of coating debris or to remove traces of any solvent or liquid remaining on the roll. Thus, an independent fluid supply port may be incorporated in the housing, or a single port may suffice for the supply of both liquid and gas through an appropriate valve control assembly.

Repetitive cleaning of a coating roll is facilitated by the provision of a magazine containing a plurality of replacement scraper members encircling the end of the roll, thereby enabling a spent scraper to be removed - for example, by twisting or breaking the scraping, and a replacement scraper to be slipped into the housing without removing the coating roll from its mounting bearings. Desirably, therefore, the end of the coating roll is slightly tapered to provide a zone of reduced cross-section around which the replacement scrapers may be located without abrading the roll during its normal coating operations.

Although the invention is hereinbefore described in relation to the cleaning of a single roll, it will be appreciated that simultaneous cleaning of a plurality of rolls may be effected. For example, a bank of smoothing rolls, e.g. four or six rolls disposed in axially parallel relationship, may be cleaned simultaneously by means of a carriage reciprocable parallel to the roll axes and supporting a plurality of scraping assemblies, as hereinbefore defined, each

associated with one of said rolls.

Rotation of the, or each, roll, if desired during the cleaning operation, may be effected by the normal drive mechanism for the roll in question. Alternatively, a separate drive mechanism independent of that employed during the coating operating may be employed.

The invention is illustrated by reference to the accompanying drawings in which:

75 *Figure 1* is a schematic sectional elevation, not to scale, of a scraping assembly slideably mounted on a smoothing roll,

80 *Figure 2* is a schematic end elevation, not to scale, of the scraper housing along the line II-II of Figure 1,

85 *Figure 3* is a schematic plan view along the line III-III of Figure 2,

Figure 4 is an enlarged sectional part view of a scraper member and housing,

85 *Figure 5* is a schematic plan view of a carriage assembly for simultaneously cleaning a plurality of coating rolls, and

90 *Figure 6* is a sectional elevation along the line VI-VI of Figure 5.

Referring to Figure 1 of the drawings, a smoothing roll 10 mounted in bearing supports 11, 12 on base-plate 13 can be rotated about its longitudinal axis by a pulley 14.

A rigid slide rod 15 mounted between pillars 16, 17 of a relatively rigid framework on base-plate 13 is aligned parallel to the longitudinal axis of roll 10 and supports, by means of a slide-bearing 18, a housing 19 for two opposed annular scraping members 20, 21 disposed with their respective scraping edges 22, 23 in engagement with the roll surface.

100 Reciprocation of housing 19 along the central coating section of roll 10 is effected by a pneumatic piston 24 and cylinder 25 assembly coupled through piston shaft 26 and linkage 27 to slide-bearing 18, compressed air being supplied to cylinder 25 through inlet ports 28, 29 in turn by a suitable switching mechanism (not shown). The reciprocating action of scraping edges 22, 23 effectively removes encrusted deposits of coating medium from the surface of roll 10.

110 The housing, as shown in Figures 2 and 3, comprises a collar 30 with a cylindrical bore 31 to accommodate roll 10. Each end of the bore is profiled to provide an annular recess 32, 33 and an annular rim or lip 34, 35 to retain a scraping member therein.

115 The mechanism by which a scraping member is retained in the collar is evident from Figure 4. The resilient scraping member comprises a generally cylindrical body portion 40 with an outwardly inclined stub flange 41 and a longer flange 42 inwardly inclined towards the roll axis to provide a scraping edge 43. Slight radial compression enables the scraping member to be inserted axially into the housing bore. Radial expansion of the scraping member on release of the compression ensures that stub flange 41 securely engages in recess 33 and that axial movement of the scraping member relative to the housing is prevented by lip 35.

120 A port 44 is provided in collar 30 for the supply of a liquid or gas to the roll surface to facilitate the

removal of deposits therefrom during the cleaning operation.

Referring to Figures 5 and 6 of the drawings, a carriage assembly for simultaneously cleaning a bank of rolls comprises a rigid platform 50 supporting five independent housings 51, 52, 53, 54, 55 of a kind similar to that hereinbefore described in relation to Figures 2 and 3, each housing containing two opposed annular scraping members 56, 57 (illustrated only in respect of housing 52) for engagement with the associated smoothing roll 58, 59, 60, 61, 62. The platform is slideably mounted on a pair of rigid guide rods 63, 64 in slide bearings 65, 66 aligned parallel to the longitudinal axes of the smoothing rolls, and is reciprocated along the contaminated portion of the rolls by a pair of pneumatic piston and cylinder assemblies 67, 68 to effect the desired cleaning operation.

The invention is further illustrated by reference to the following Examples.

Example 1

A biaxially oriented polypropylene film was coated with an aqueous dispersion containing approximately 40 weight per cent of a heat-sealable vinylidene chlorideacrylonitrile copolymer (88:12 by weight), the aqueous coating medium being applied to the film from a conventional roller system and subsequently spread on the film surface by a bank of six polished smoothing rolls each of diameter 50 mm, width 1 metre, and rotating contrary to the direction of travel of the film at a peripheral speed of 2.54 ms^{-1} .

At the end of the coating operation the smoothing rolls were heavily encrusted with dried coating latex. These were allowed to dry further for 16 hours at ambient temperature.

Using a device of the kind illustrated in Figure 1 of the drawings, containing two opposed polyamide scraping members, and with water being fed onto the roll surface, removal of all the encrusted deposits from one of the smoothing rolls was effected in less than 5 minutes, the roll surface being restored to an acceptably smooth and highly polished state.

Example 2

This is a comparative Example not according to the invention.

A second equally contaminated smoothing roll from the bank described in Example 1, was, after drying from 16 hours at ambient temperature, removed and manually cleaned using commercially available abrasive scouring pads. Several hours of arduous effort were required to restore this roll to a condition comparable to that of the roll cleaned according to Example 1.

CLAIMS

1; An apparatus for cleaning the surface of a coating roll comprising a scraping assembly including a scraping member having a scraping edge conforming to at least a circumferential portion of said roll surface, and a housing or supporting said member with the

scraping edge in engagement with said roll surface, and

means for reciprocating the scraping assembly relative to the longitudinal axis of the coating roll.

5 2. An apparatus according to claim 1 wherein the scraping member is a unitary ring dimensioned to embrace the roll surface.

3. An apparatus according to claim 2 wherein the scraping ring comprises an annular body portion,

10 75 having an orifice therein to accommodate a coating roll, and an annular lip extending from the periphery of the orifice and inclined to the longitudinal axis of the roll at an included angle not exceeding 30° .

4. An apparatus according to any one of the 80 preceding claims wherein the scraping member comprises a plurality of axially spaced apart scraping edges disposed in axially opposite directions.

5. An apparatus according to any one of the 85 preceding claims wherein the housing comprises an annular collar having an axial bore therein to receive the roll, and means to releasably retain a scraping member in engagement with the roll surface.

6. An apparatus according to any one of the 90 preceding claims wherein the housing includes a supply port for directing a fluid to the roll surface.

7. An apparatus according to any one of the 95 preceding claims including a magazine containing a plurality of replacement scraper members.

8. An apparatus constructed and arranged substantially as herein described and with reference to any one of the drawings.

9. A method of cleaning the surface of a rotatable coating roll comprising conforming the scraping edge of a scraping member to at least a circumferential portion of said roll surface, rotating the coating roll about its longitudinal axis, and reciprocating the scraping member along the roll surface relative to said longitudinal axis.

10. A coating roll the surface of which has been cleaned by the method of claim 9.

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